

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

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Priority date (day/month/year)

15 December 1997 (15.12.97)

Applicant

DEWAR, Kevin et al

1. The designated Office is hereby notified of its election made:



in the demand filed with the International Preliminary Examining Authority on:

02 June 1999 (02.06.99)



in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).



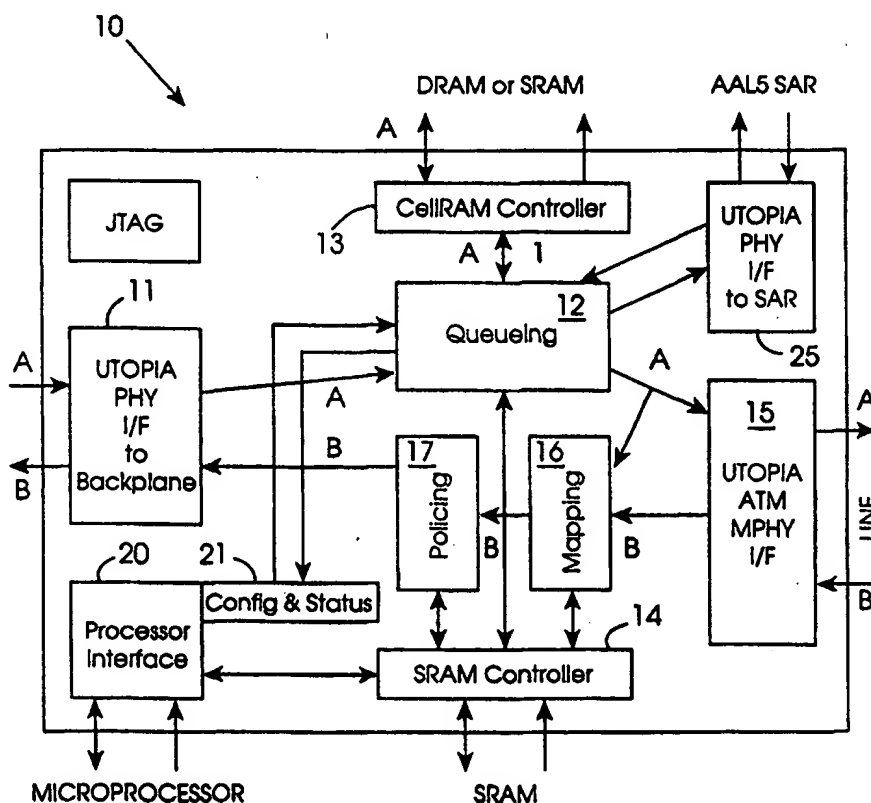
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : H04Q 11/04	A2.	(11) International Publication Number: WO 99/31928 (43) International Publication Date: 24 June 1999 (24.06.99)
<p>(21) International Application Number: PCT/IE98/00106</p> <p>(22) International Filing Date: 15 December 1998 (15.12.98)</p> <p>(30) Priority Data: 970888 15 December 1997 (15.12.97) IE S980712 31 August 1998 (31.08.98) IE</p> <p>(71) Applicant (for all designated States except US): TELLABS RESEARCH LIMITED (IE/IE); Shannon Industrial Estate, Shannon, County Clare (IE).</p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): DEWAR, Kevin [GB/IE]; Stone Park, Ballyallia, Ennis, County Clare (IE). O'DOWD, Brendan [IE/IE]; 4 Ashmount, Raheen, Limerick (IE). BREBNER, Gavin [GB/FR]; 73, chemin Charrière Blache, F-69130 Emilly (FR).</p> <p>(74) Agents: O'BRIEN, John, A. et al.; John A. O'Brien & Associates, Duncairn House, 3rd floor, 14 Carysfort Avenue, Blackrock, County Dublin (IE).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DE (Utility model), DK, DK (Utility model), EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published Without international search report and to be republished upon receipt of that report.</p>

(54) Title: AN ATM CELL PROCESSOR

(57) Abstract

An ATM cell processor (10) has a backplane interface (11), a line interface (15), and various processing functions between the interfaces. Cells directed to the line interface (15) are controlled by a queueing function (12) which uses external cell memory via a controller (13) and external control memory via a controller (14). Cells from the backplane are identified and routed by a mapping function (16).



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"An ATM Cell Processor"INTRODUCTION5 Field of the Invention

The invention relates to a processor for handling asynchronous transfer mode (ATM) cells.

10 Prior Art Discussion

The ATM technique supports many different services such as voice, frame relay, or circuit emulation. Also, the throughput rates are quite high, in the order of hundreds of thousands of cells per second.

15

The general approach has been to provide extensive circuitry to handle the many cell processing functions required. For example, European Patent Specification No. EP614324 (Nippon) describes circuitry having cell assembly and disassembly control circuits and memory access control circuits.

20

Such circuits tend to be limited in their functionality and to be complex.

Objects of the Invention

25 An object of the invention is to provide for efficient handling of cells by a processor. Another object is that the processor has flexibility in the manner in which it operates so that it may be used in different environments with relatively simple configuration.

A still further object is to provide a cell processor which may be controlled in a
30 comprehensive manner with relatively simple control circuits.

- 2 -

SUMMARY OF THE INVENTION

According to the invention, there is provided an ATM cell processor comprising a line interface, a backplane interface, and processing means for identifying cells according to their headers and processing the identified cells.

Thus the processor may be integrated in a flexible manner in a system having multiple cell streams.

10 In one embodiment, the line and backplane interfaces are bi-directional. This provides excellent versatility for cell processing.

In one embodiment, the processing means comprises a mapping function. This allows mapping of received cells according to the VPI/VCI.

15 Preferably, the mapping function comprises means for changing the cell headers according to mapped cell destinations.

In one embodiment, the mapping function comprises means for adding an additional header to a cell for internal control signalling.

20 In another embodiment, the processing means further comprises a policing function for monitoring traffic characteristics. This allows integration in a system connected to multiple client systems and is particularly useful for monitoring contracts.

25 In a further embodiment, the processing means comprises a queueing function connected between the interfaces for controlling transfer of cells to the line interface. This provides for effective cell traffic management.

30 In another embodiment, the queueing function comprises means for interfacing with a cell memory for storage of cell queues, and with a control memory for storing queueing

- 3 -

parameter values. This enhances flexibility in the manner in which cells are queued. It also provides for simple queueing control.

5 In one embodiment, the queueing function, is connected to a memory controller for interfacing with the cell and control memories.

Preferably, the queueing function comprises means for managing path descriptor tables in the control memory.

10 In another embodiment, the queueing function comprises means for managing queue descriptor tables, each relating to individual queues in the control memory.

15 In one embodiment, the cell processor further comprises a segmentation and reassembly (SAR) interface for routing of cells to an external SAR device. This allows connection of the cell processor to a control processor in an efficient manner using cells for control signalling.

Preferably, the SAR interface is connected to the queueing function.

20 In one embodiment, the cell processor comprises a control processor interface for connection to a memory controller to allow initial set-up configuration.

DETAILED DESCRIPTION OF THE INVENTION

25 Brief Description of the Drawings

The invention will be more clearly understood from the following description of some embodiments thereof, given by way of example only with reference to the accompanying drawings in which:-

30

Fig. 1 is a schematic representation of a cell processor of the invention;

- 4 -

Fig. 2 is a diagram illustrating operation of a queue server matrix; and

Fig. 3 is a diagram illustrating a UTOPIA interface of the cell processor.

5

Description of Embodiments

Referring to Fig. 1, there is shown a cell processor 10 of the invention. The processor 10 is an application specific integrated circuit (ASIC), the application being processing of ATM cells.

10

The main components of the ASIC 10 are now briefly described briefly with reference to general signal flows through the processor. The cell rate handled is 373 K cells per second, which represents a bit rate of greater than 155 Mpps. The ASIC 10 has a backplane interface 11 for interfacing according to the CUBIT™ protocol via a backplane.

15

A queueing function 12 performs extensive buffering operations using DRAM or SRAM external to the ASIC 10 and is accessed via a CellRAM controller 13. It also uses an SRAM controller 14 for access to additional off-chip SRAM. The off-chip memory is used in general for such things as manipulating link lists, and storing cells awaiting transfer. More specifically, the SRAM accessed by the SRAM controller 14 is used effectively as an external register and to store queue parameters including the queue sizes. On the other hand, the DRAM or SRAM accessed via the CellRAM controller 13 is used for storing actual cells. When dequeuing from the Cell RAM, the SRAM is used to track the cells using pointer information.

20

25

Cells received in the direction A at the backplane interface 11 are passed to the queueing function 12, and may be routed to CellRAM. Continuing on the path A indicated in Fig. 1, the cells are then transferred to a multi-PHY line interface 15. This is a master

30

- 5 -

interface which supports many ports, in this embodiment eight. Again, the UTOPIA protocol is used.

Thus, in the path A, the ASIC 10 does not change the cells, but does manage output to the line by using queueing mechanisms and external memory.

In the opposite direction, cells are received as indicated by the arrow B at the line interface 15 and are transferred to a mapping function 16. The mapping function 16 changes the VCI/VPI headers according to the destination of the cells and by doing this, it re-directs them to the correct destination. It does not "know" what the different cell streams represent, but it identifies the streams by their headers. The cells are passed to a policing function 17 which operates according to algorithms to evaluate certain policing parameters such as the cell rate for a particular contract. Various parameters are taken into account such as the temporary nature of any usage of excessive bandwidth for a particular contract. The SRAM accessed via the SRAM controller 14 is used for some of these functions. After the policing functions, the cells are transferred to the backplane interface 11.

The ASIC 10 also comprises a processor interface 20 and a configuration and status function 21, which are connected to the queueing function 12 and the SRAM controller 14. This allows a microprocessor to access the ASIC 10 and perform a limited set of functions including initial setup and configuration and subsequent status monitoring. An important initial setup function is configuration of the SRAM 14. Subsequently, the processor can access the SRAM locations via the controller 14 and the interface 20 to monitor parameters such as the count of dropped cells.

An important aspect of the ASIC 10 is that it can use control signals communicated in the ATM format. To do this, it uses a segmentation and reassembly (SAR) interface 25 which is connected to a SAR device which performs AAL5 segmentation and reassembly of ATM messages. This interface is used for communication of ATM messages with a SAR device. The SAR device interfaces with another device such as a microprocessor

- 6 -

(possibly the same microprocessor as is connected to the interface 20) for comprehensive control communication. The ATM nature of the communication is transparent to the microprocessor because of operation of the SAR device. Thus, a single microprocessor may have access to the ASIC 10 in two different manners, one being a direct access for
5 initial setup and monitoring of parameters, the other being for comprehensive control communication.

Referring again to the direction A of Fig. 1 the cells which are received at the backplane interface 11 are queued in one of the multiple queues depending on their VPI/VCI. The
10 queues are serviced on a pre-programmed basis to implement a priority queueing system. Queues that grow too large may have cells discarded on a configured basis. Statistics are kept on the number of cells received, the number of cells transmitted, the number of bad cells, and the number of cells dropped due to congestion.

15 Queueing is initialised by a microprocessor using the configuration and status function 21. This function has registers, in which there is a notional split of registers related to queueing and those related to dequeueing. The queueing function 12 uses a significant number of tables to control the buffering and congestion management functions. One such table is a path descriptor, the start address of which is provided by a configuration
20 register. The VPI of an incoming cell is used to form an offset into this table. In addition there are special path descriptors for mapping, for the SAR, and for the processor, the addresses again being provided by configuration registers.

Another table is a queue descriptor, which contains information about an individual
25 queue. All queues are identical, however, they may appear to have different priorities depending on programming of a queue server matrix. Queues are irrevocably tied to target output ports and each of the eight line ports has eight queues associated with it. In addition, a single queue is maintained for each of the processor, SAR, and mapping entities. Mapping between queues and targets is specified in two tables, one for each of
30 aggregate and tributary modes. Each queue has a four-word descriptor, and the offset

- 7 -

from the value of the configuration register holding the start location is simply the queue number multiplied by four.

5 A queue server matrix 30 is shown in Fig. 2. It controls the order in which queues are serviced. Its location and maximum size (1024 elements) are indicated by configuration registers. Each element (31) of the matrix holds eleven used fields. Each field is associated with a queue. The queues are checked in ascending order, i.e. the first queue checked is the most significant byte of the first word. Within each byte, only the least significant seven bits are meaningful, i.e. bits 6 to 0. The value in a field indicates the
10 priority level for the associated queue.

Storage pools of the queues are referred to as heaps, and consist of stacks of DRAM addresses. There are twenty heaps maintained. The heap structure is implemented as a set of pointers kept internally and also the DRAM addresses which are stored in the
15 SRAM. Initialisation of the heap involves programming up the pointers into SRAM for the top-of-stack and start-of-stack for each used heap, and then initialisation of the SRAM location between those two pointer values with a unique and valid set of DRAM locations. Configuration registers are used for programming the heap pointers.

20 These features provide excellent flexibility in the manner in which queues are set up and dynamically managed.

As shown in Fig. 1, the output cells of the queueing function are transferred to the line interface 15 or the SAR interface 25.

25

In the opposite direction, cells received at the line interface 15 are passed to the mapping and policing functions 16 and 17. The cells are passed to the backplane interface 11, to the queueing function 12, or are dropped. Again, the configuration registers store the initialisation information. SRAM tables are maintained by the functions 16 and 17.

30 There are five tables associated with the mapping function 16 as follows:

- 8 -

- per port statistics table,
- VCC connection table,
- 5 - dequeue connection table, and
- secondary mapping descriptor table.

Storage of these tables is set by the configuration registers. The per port statistics table
10 stores information including the numbers of cells with invalid and disabled VPI/VCIs and
with unsupported PTIs. It also includes the VPI/VCIs of the last disabled and invalid
cells.

The VCC connection table contains the following information on a per connection basis:-
15

- mapping descriptor,
- received cell count,
- 20 dropped cell count, and
- GCRA words 1 – 4.

The VPC connection table is identical, except that VPIs are used in place of VCIs.
25

The dequeue connection table has a maximum of 1024 entries and consists of 1024 32 bit
mapping descriptors.

The secondary mapping descriptor table consists of 4096 32 bit entries. Each secondary
30 mapping descriptor is 14 bits long, as set out below.

- 9 -

	<u>Field Name</u>	<u>Size</u>	<u>Bit Position</u>
	Reserved	18	14-31
	map_vpi	1	13
	cell_routing	3	10-12
5	vci_map	10	0-9

Referring now to the three UTOPIA interfaces 11, 15, and 25, Fig. 3 shows an overview. All of the interfaces use the appropriate Start-of-Cell (SOC) signal to initialise cell reception from an external source. Each interface counts octets and an error indication is given when a SOC is activated at an unexpected time. This gives a warning of malformed cells entering the ASIC whilst providing a mechanism to recover at the next cell boundary. Short cells are discarded, whilst long cells are truncated and passed on. Both cause an error indication. Before cells are transferred internally, they are synchronised to the internal common system clock "sys clk". A phase locked loop (PLL) 40 provides the internal clock signal from an external microprocessor 42. A SAR device 43 is shown connected to the SAR interface 25. Also, line and backplane devices 44 and 45 are shown connected to their respective interfaces.

It will be appreciated that the invention provides for very efficient processing of ATM cells between a line and a backplane. Varying rates of cell transfer are handled effectively by the queueing mechanism. The circuit also supports many different services by efficiently routing cell streams. The circuit also allows policing functions to be implemented very efficiently with little effect on cell transfer rates.

The invention is not limited to the embodiments described, but may be varied in construction and detail within the scope of the claims.

- 10 -

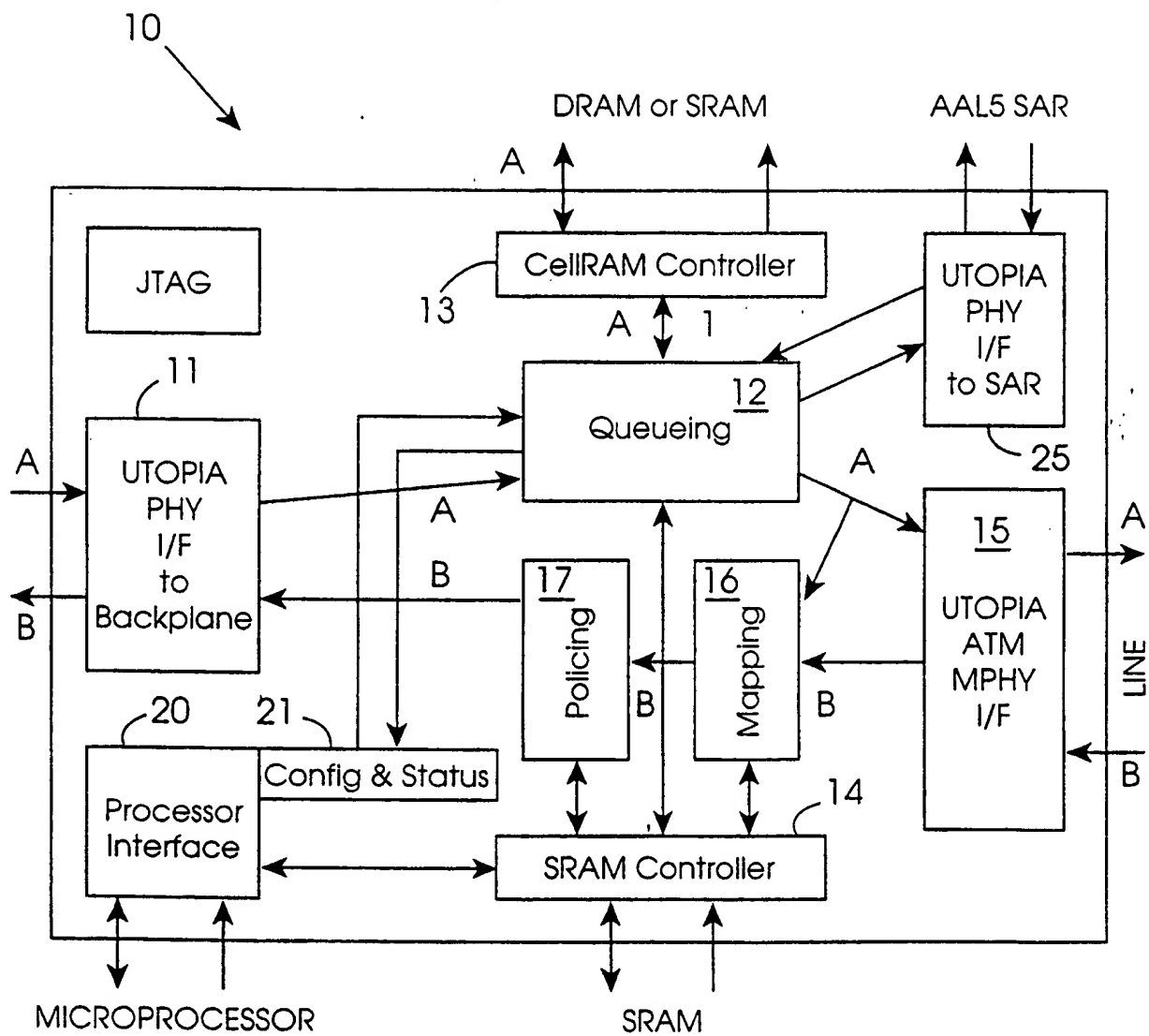
Claims

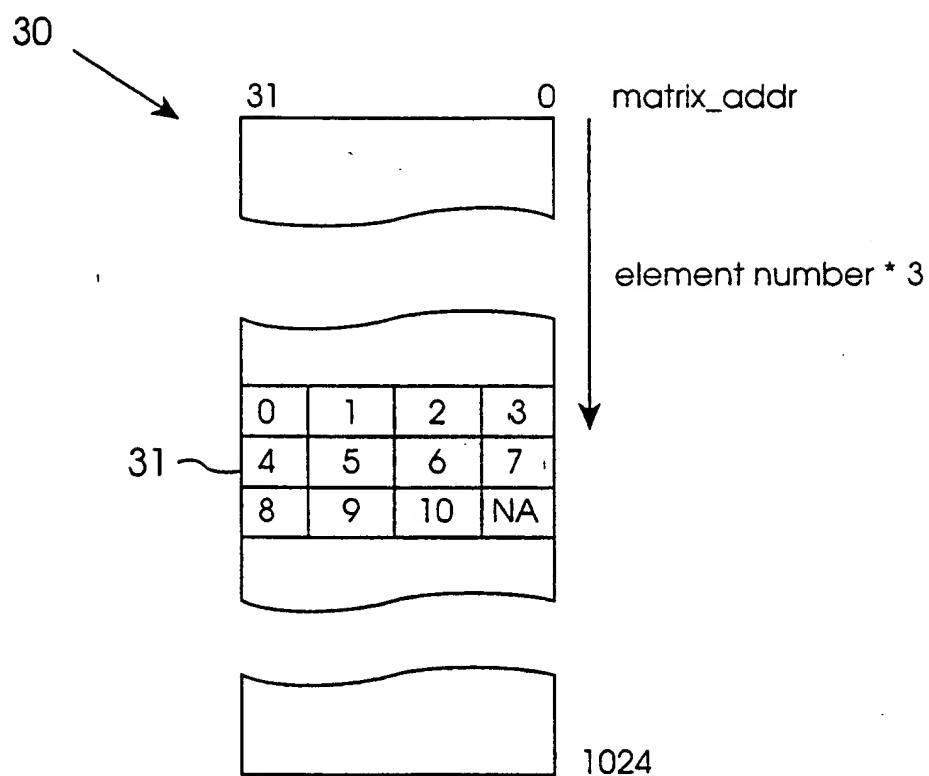
1. An ATM cell processor comprising a line interface, a backplane interface, and processing means for identifying cells streams according to their headers and processing the identified cells.
5
2. A cell processor as claimed in claim 1, wherein the line and backplane interfaces are bi-directional.
- 10 3. A cell processor as claimed in claims 1 or 2, wherein the processing means comprises a mapping function.
4. A cell processor as claimed in any preceding claim, wherein the mapping function comprises means for changing the cell headers according to mapped cell destinations.
15
5. A cell processor as claimed in any preceding claim, wherein the mapping function comprises means for adding an additional header to a cell for internal control signalling.
20
6. A cell processor as claimed in any preceding claim, wherein the processing means comprises a policing function for monitoring traffic characteristics.
7. A cell processor as claimed in any preceding claim, wherein the cell processor comprises a queueing function connected between the interfaces for controlling transfer of cells to the line interface.
25
8. A cell processor as claimed in claim 7, wherein the queueing function comprises means for interfacing with a cell memory for storage of cell queues, and with a control memory for storing queueing parameter values.
30

- 11 -

9. A cell processor as claimed in claim 8, wherein the queueing function is connected to a memory controller for interfacing with the cell and control memories.
- 5 10. A cell processor as claimed in claims 8 or 9, wherein the queueing function comprises means for managing path descriptor tables in the control memory.
11. A cell processor as claimed in any preceding claim, wherein the queueing function comprises means for managing queue descriptor tables, each relating to
10 individual queues in the control memory.
12. A cell processor as claimed in any preceding claim, wherein the cell processor further comprises a segmentation and reassembly (SAR) interface for routing of cells to an external SAR device.
- 15 13. A cell processor as claimed in claim 12, wherein the SAR interface is connected to the queueing function and the queueing function comprises means for routing cells to the SAR interface and the line interface according to the cell headers.
- 20 14. A cell processor as claimed in any preceding claim, wherein the cell processor comprises a control processor interface for connection to a memory controller to allow initial setup configuration.
- 25
- 30

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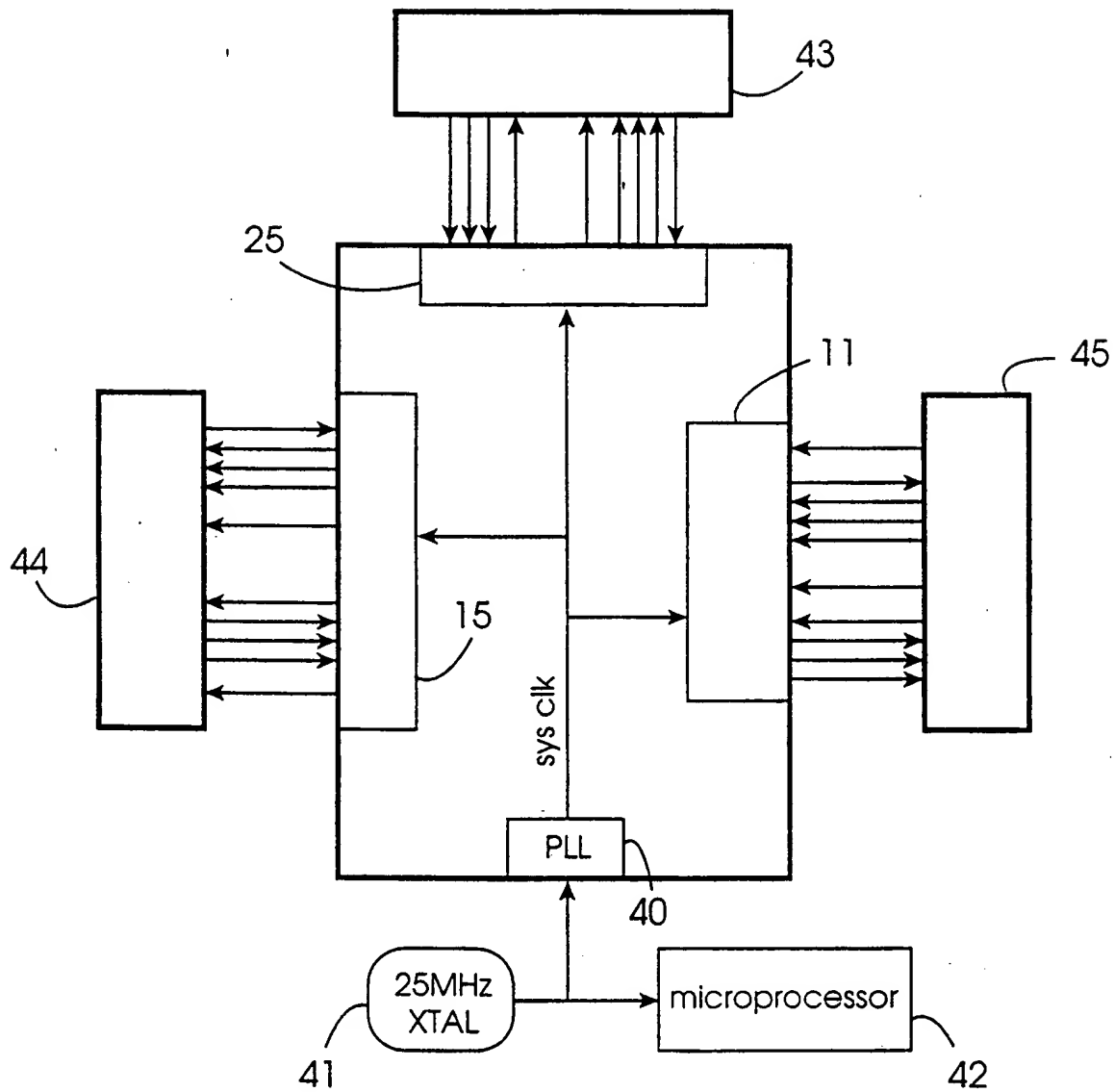


Fig. 3

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference TELL07/C/WO	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/IE98/00106	International filing date (day/month/year) 15/12/1998	Priority date (day/month/year) 15/12/1997
International Patent Classification (IPC) or national classification and IPC H04Q11/04		
Applicant TELLABS RESEARCH LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 9 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 02/06/1999	Date of completion of this report 07.03.2000
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Bösch, M Telephone No. +49 89 2399 7523 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IE98/00106

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-9 as originally filed

Claims, No.:

1-19 as received on 22/12/1999 with letter of 20/12/1999

Drawings, sheets:

1/3-3/3 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IE98/00106

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	3-12, 14-19
	No:	Claims	1,2,13
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-19
Industrial applicability (IA)	Yes:	Claims	1-19
	No:	Claims	

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/IE98/00106

Reference is made to the following documents:

- D1: DANIEL UPP: 'Cubit, a switching matrix for ATM' ELEKTRONIK PRAXIS, vol. 31, no. 4, 28 February 1996 (1996-02-28), pages 32-34,36, XP002100146 Germany
- D2: WO 97 42735 A (MAKER COMMUNICATIONS INC) 13 November 1997 (1997-11-13)
- D3: EP-A-0 752 796 (SUN MICROSYSTEMS INC) 8 January 1997 (1997-01-08)
- D4: HOGAN M ET AL: 'An architectural framework for the support of integrated services by broadband customer premises equipment' COMPUTER NETWORKS AND ISDN SYSTEMS, vol. 29, no. 5, April 1997 (1997-04), page 595-610 XP004059230

Concerning Section V.

Reasoned statement with regard to novelty, inventive step or industrial applicability

- 1 The present application does not meet the requirements of Article 33(2) PCT, because the subject-matter of **Claim 1** is not novel. Document D1 is regarded as being the closest prior art.

This document already shows an ATM cell processor (see D1, page 32, headline) comprising a line interface (see D1, page 36, column 1, lines 7-10 and element "*UTOPIA-Interface*" of the figure), a backplane interface (see D1, page 36, column 1, lines 59-65 and element "*Cell Bus- Interface*" for connections to the "*Back Plane Cell Bus*" of the figure) and processing means between the interfaces for processing cells according to their headers (see D1, page 36, column 1, lines 16-50 and element "*Header Processor*" of the figure).

Within this cell processor, the processing means comprises a segmentation and reassembly (SAR) interface (see D1, page 36, column 4, lines 17-20 and element "*Microprocessor Interface*" of the figure), a queueing function comprising means for controlling transfer of cells to the line interface and to the SAR interface according to the cell headers (see D1, page 36, column 4, lines 10-20 and elements "*CBR Queue*", "*VBR Queue*", "*ABR Queue*", "*Control Queue*" and

"*Queue Distribution*" of the figure), and a mapping function comprising means for changing cell headers during transfer from the line interface to the backplane interface according to mapped cell destinations (see D1, page 36, column 1, lines 28-42 and element "*Header Processor*" of the figure).

- 2 The dependent **Claims 2 and 13** do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty, because all of them are already disclosed in the ATM cell processor of document D1.

- Claim 2:

The queueing function comprises means for receiving control cells from the SAR interface (see D1, page 36, the arrow from "*Microprocessor interface*" to "*Receive Management*" in the figure)

- Claim 13:

The mapping function comprises means for adding an additional header to a cell for internal control signalling (see page 36, column 1, lines 39- 42 and column 2. lines 8-13).

- 3 Furthermore, the dependent **Claims 3-9 and 12** do not contain any additional features which supplement the subject-matter of any claim to which they refer so as to meet the requirements of Article 3(3) PCT in respect of inventive step, the reason being as follows:
- 3.1 The above described subject-matter disclosed by D1 is considered to represent the most relevant state of the art. From this ATM-cell processor the subject-matter of these dependent claims differs in that the queueing function is implemented as heap in an external memory which is controlled by modifiable tables in an external control memory, whereas in D1 it is assumed that these queues are FIFOs implemented on the ATM cell processor chip with fixed configuration.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/IE98/00106

The differences in detail are:

- *"the processing means comprises a cell memory controller for interfacing with an external cell memory, and the queueing function comprises means for accessing a cell memory via said controller" (see Claim 3)*
- *"the queueing function comprises means for accessing a control memory via said controller" (see Claim 4).*
- *"the processing means comprises a configuration and status function connected to the queueing function and to the control memory controller, and means for allowing an external microprocessor access said control memory for initial setup and configuration and subsequent status monitoring" (see Claim 6).*
- *"the queueing function comprises means for managing path descriptor tables in a control memory" (see Claim 7)*
- *"the queueing function comprises means for using the VPI of an incoming cell to form an offset into the path descriptor table" (see Claim 8)*
- *the "queueing function comprises means for managing queue descriptor tables" (see Claim 9)*
- *"the queueing function comprises means for maintaining a plurality of queue storage pool heaps by maintaining a set of pointers programmed using configuration registers" (see Claim 12)*

Remarks:

- a) *"The processing means (comprising) a control memory controller for interfacing with an external control memory" of Claim 4 is already disclosed by D1 (see page 36, column 1, lines 27-37 and element "RAM Interface" of the figure).*
- b) *"The queueing function (comprising) means for dequeuing from a cell memory and for tracking the cells using pointer information retrieved from a control*

memory" (see Claim 5) is also already disclosed by D1 (see page 36, column 4, lines 10-20 and elements "*CBR Queue*", "*VBR Queue*", "*ABR Queue*", "*Control Queue*" and "*Queue Distribution*" of the figure), whereby an internal cell memory and a internal control memory are implicitly provided.

c) Additionally, "*the status function (comprised by) the processing means for (...) subsequent status monitoring*" (see Claim 6) is disclosed by D1 (see page 36, column 4, lines 44-56).

- 3.2 The problem to be solved by the present invention may therefore be regarded as to enhance flexibility concerning the number of queues and their size.
- 3.3 In order to solve the problem posed, a person skilled in the art faced by this problem would regard it as a normal design option to implement the queues using a memory with an interface for access, and to manage these queues by about 3 pointers, which usually are kept in a so-called descriptor table (see D3, column 3, lines 11-25, 36-42 and 49-59). The person skilled in the art would replace the probably hard-wired FIFO-Implementation of D1 by the RAM-based solution of the ATM- computer-interface disclosed by D3, because that solution is used there to provide the flexibility concerning different data communication requirements like number of channels and bandwidth (see D3, column 1, lines 44-55).

So, the required inventive step according to Article 33(3) PCT is not apparent.

- 4 Similarly, the dependent **Claims 10 and 11** do not fulfill the requirements of Article 3(3) PCT in respect of inventive step.

- 4.1 The defined subject-matter differs in the following points from the closest prior art disclosed by D1:

- "*the queueing function comprises means for managing a queue server matrix, the location and size of which is indicated by configuration registers and in which each element of the matrix stores a plurality of fields and each field is associated with a queue*" (see Claim 10)

- *"the queueing function comprises means for checking queues in ascending order in an element by starting with a most significant byte in the fields of each element"*
(see Claim 11)

4.2 The problem to be solved could be regarded as to implement another method of effective scheduling the cell queues with a simple queueing control.

4.3 No inventive step could be seen, because Document D2 already discloses an ATM cell processor (see page 16, lines 4-7, figure 1A, element 12 and the whole figure 2) with external memory interfaces (see page 18, line 20 - page 19, line 2, and figure 2, elements 72 and 68) performing the same solution by the use of a queue server matrix (see *"primary scoreboard"* page 17, lines 10-13 and page 4, lines 17- page 5, line 6). It would therefore be obvious to the person skilled in the art to apply these features with corresponding effect to the system disclosed by D1, thereby arriving at an ATM cell processor according to Claims 10 and 11.

5 In **Claim 14** a slight constructional change consistent of *"means for passing cells to the queueing function"* is defined which comes within the scope of the customary practice followed by persons skilled in the art, especially as the advantages thus achieved can readily be foreseen. Consequently, the subject-matter of Claim 14 also lacks an inventive step.

Remark: The *"means for maintaining tables in a control memory"* of **Claim 15** is already disclosed by D1 (see page 36, column 1, lines 27-37.)

6 The arrangement of the policing function according to **Claims 16-19** is considered as being common practice in this technical field. The skilled person would for example count the number of received cells (see D4, page 606, right column, line 23) or determine the GCRA (see D4, page 606, left column, last line) for traffic policing reasons. Some kind of inventive step is as such not apparent.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/IE98/00106

Concerning Section VII,

Certain (formal) defects in the international application

- 1 As amended claims have been filed, the opening part of the description on page 2 and 3 should have been brought into agreement with the wording thereof (see Rule 5.1(a)(iii) PCT).
- 2 In order to meet the requirements of Rule 5.1.(a),(ii) PCT, the relevant prior art, i.e. the documents noted above, should have been acknowledged by reference and briefly discussed in the introductory part of the description, so that the difference of the subject-matter of the invention defined by the independent claim vis-à-vis the state of the art and the significance thereof for explaining the invention are indicated in a clear and unambiguous manner.

REPLACED BY
ART 34 AMDT

- 10 -

Claims

1. An ATM cell processor comprising a line interface, a backplane interface, and processing means for identifying cells streams according to their headers and processing the identified cells.
5
2. A cell processor as claimed in claim 1, wherein the line and backplane interfaces are bi-directional.
- 10 3. A cell processor as claimed in claims 1 or 2, wherein the processing means comprises a mapping function.
4. A cell processor as claimed in any preceding claim, wherein the mapping function comprises means for changing the cell headers according to mapped cell destinations.
15
5. A cell processor as claimed in any preceding claim, wherein the mapping function comprises means for adding an additional header to a cell for internal control signalling.
20
6. A cell processor as claimed in any preceding claim, wherein the processing means comprises a policing function for monitoring traffic characteristics.
7. A cell processor as claimed in any preceding claim, wherein the cell processor comprises a queueing function connected between the interfaces for controlling transfer of cells to the line interface.
25
8. A cell processor as claimed in claim 7, wherein the queueing function comprises means for interfacing with a cell memory for storage of cell queues, and with a control memory for storing queueing parameter values.
30

- 11 -

9. A cell processor as claimed in claim 8, wherein the queueing function is connected to a memory controller for interfacing with the cell and control memories.
- 5 10. A cell processor as claimed in claims 8 or 9, wherein the queueing function comprises means for managing path descriptor tables in the control memory.
11. A cell processor as claimed in any preceding claim, wherein the queueing function comprises means for managing queue descriptor tables, each relating to
10 individual queues in the control memory.
12. A cell processor as claimed in any preceding claim, wherein the cell processor further comprises a segmentation and reassembly (SAR) interface for routing of cells to an external SAR device.
- 15 13. A cell processor as claimed in claim 12, wherein the SAR interface is connected to the queueing function and the queueing function comprises means for routing cells to the SAR interface and the line interface according to the cell headers.
- 20 14. A cell processor as claimed in any preceding claim, wherein the cell processor comprises a control processor interface for connection to a memory controller to allow initial setup configuration.
- 25
- 30

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference TELL07/C/WO	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/ IE 98/ 00106	International filing date (day/month/year) 15/12/1998	(Earliest) Priority Date (day/month/year) 15/12/1997
Applicant TELLABS RESEARCH LIMITED et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 5 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of Invention is lacking (see Box II).

4. With regard to the title,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

1

☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IE 98/00106

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

As a result of the prior review under R. 40.2(e) PCT,
no additional fees are to be refunded.

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☒ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-6

An ATM cell processor comprising means for adding an additional header to a cell and a policing function.

2. Claims: 7-11,14

An ATM cell processor comprising a queueing function and memory controller.

3. Claims: 12,13

An ATM cell processor comprising a segmentation and reassembly interface.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/08014

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : H04L 12/56

US CL : 370/409,459

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 370/395, 396, 397, 398, 399, 409, 410, 412, 415, 428, 429, 442, 443, 444, 458, 459

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS

search terms: time slot, ATM, scheduling

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, 5,241,536 A (GRIMBLE ET AL) 31 August 1993, col. 7-8.	1, 2, 8, 12, 14, 16-22, 28, 32-35
A	US, 5,394,397 A (YANAGI ET AL) 28 February 1995	1-35

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

A	document defining the general state of the art which is not considered to be of particular relevance	*T*	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
E	earlier document published on or after the international filing date	*X*	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
L	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Y*	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
O	document referring to an oral disclosure, use, exhibition or other means	*Z*	document member of the same patent family
P	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

24 JULY 1997

Date of mailing of the international search report

21 AUG 1997

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer
WANG BIN YAO

Telephone No. (703) 305-4700

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International Application No

PCT/IE 98/00106

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 H04Q11/04 H04L12/56

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04Q H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DANIEL UPP: "Cubit, a switching matrix for ATM" ELEKTRONIK PRAXIS, vol. 31, no. 4, 28 February 1996 (1996-02-28), pages 32-34, 36, XP002100146 Germany page 34, column 4, line 59 - page 36, column 4, line 5 --- -/--	1-5

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

15 July 1999

Date of mailing of the international search report

26. 08. 99

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Dhondt, E

INTERNATIONAL SEARCH REPORT

International Application No

PCT/IE 98/00106

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	ROOHOLAMINI R ET AL: "FINDING THE RIGHT ATM SWITCH FOR THE MARKET" COMPUTER, vol. 27, no. 4, 1 April 1994 (1994-04-01), pages 16-28, XP000447748 page 18, right-hand column, line 34-41 page 11, right-hand column, line 32-55 page 11, right-hand column, line 56 - page 12, left-hand column, line 25 ---	1-5
X	HOGAN M ET AL: "An architectural framework for the support of integrated services by broadband customer premises equipment" COMPUTER NETWORKS AND ISDN SYSTEMS, vol. 29, no. 5, April 1997 (1997-04), page 595-610 XP004059230 abstract page 597, right-hand column, line 1,2 page 597, right-hand column, line 30-43 page 605, left-hand column, line 14-35 paragraph '05.3! ---	1,6
X	WO 97 42735 A (MAKER COMMUNICATIONS INC) 13 November 1997 (1997-11-13) page 15, line 19-25 page 16, line 13-18; figure 2 page 17, line 10-13 ---	1,7-11
A	EP 0 752 796 A (SUN MICROSYSTEMS INC) 8 January 1997 (1997-01-08) abstract figure 3 ---	8,9
X	EP 0 719 065 A (IBM) 26 June 1996 (1996-06-26) column 7, line 37-41 column 9, line 27-30 column 10, line 27-31 ---	1,12,14
A	EP 0 717 533 A (FUJITSU LTD) 19 June 1996 (1996-06-19) abstract -----	12

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IE 98/00106

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
WO 9742735	A	13-11-1997	AU	2940197 A	26-11-1997
EP 0752796	A	08-01-1997	US	5664116 A	02-09-1997
			JP	9128313 A	16-05-1997
EP 0719065	A	26-06-1996	JP	8223219 A	30-08-1996
			US	5568477 A	22-10-1996
EP 0717533	A	19-06-1996	JP	8167906 A	25-06-1996
			US	5696759 A	09-12-1997

PATENT COOPERATION TREATY

WO 99/31928
PCT/IE98/00106

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

O'BRIEN, John, A.
John A. O'Brien & Associates
Duncairn House, 3rd floor
14 Carysfort Avenue
Blackrock
County Dublin
IRLANDE

Date of mailing (day/month/year) 24 June 1999 (24.06.99)		IMPORTANT NOTICE	
Applicant's or agent's file reference TELL07/C/WO			
International application No. PCT/IE98/00106	International filing date (day/month/year) 15 December 1998 (15.12.98)	Priority date (day/month/year) 15 December 1997 (15.12.97)	
Applicant TELLABS RESEARCH LIMITED et al			

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
AU,CN,EP,IL,JP,KP,KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CU,CZ,DE,DK,EA,EE,ES,FI,GB,GD,GE,GH,GM,HR,HU, ID,IN,IS,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MD,MG,MK,MN,MW,MX,NO,NZ,OA,PL,PT,RO,RU,SD, SE,SG,SI,SK,SL,TJ,TM,TR,TT,UA,UG,UZ,VN,YU,ZW
The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).
3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 24 June 1999 (24.06.99) under No. WO 99/31928

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 740.14.35	Authorized officer J. Zahra Telephone No. (41-22) 338.83.38
--	---

IPEA/ _____

PCT

CHAPTER II

DEMAND

under Article 31 of the Patent Cooperation Treaty:

The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only

Identification of IPEA		Date of receipt of DEMAND	
Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION		Applicant's or agent's file reference TELL07/CWO	
International application No. PCT/IE 98/00106	International filing date (day/month/year) 15 December 1998	(Earliest) Priority date (day/month/year) 15 December 1997	
Title of invention An ATM Cell Processor			
Box No. II APPLICANT(S)			
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) Tellabs Research Limited Shannon Industrial Estate Shannon County Clare Ireland		Telephone No.: Facsimile No.: Teleprinter No.:	
State (that is, country) of nationality: IE		State (that is, country) of residence: IE	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) Dewar, Kevin Stone Park Ballyallia Ennis County Clare Ireland			
State (that is, country) of nationality: GB		State (that is, country) of residence: IE	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) O'Dowd, Brendan 4 Ashmount Raheen Limerick Ireland			
State (that is, country) of nationality: IE		State (that is, country) of residence: IE	
<input type="checkbox"/> Further applicants are indicated on a continuation sheet.			

Continuation of Box No. II APPLICANT(S)

If none of the following sub-boxes is used, this sheet should not be included in the demand.

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

Bröbner, Gavin
73 Chemin Charriere Blache
69130 Emilly
France

State (that is, country) of nationality:

GB

State (that is, country) of residence:

FR

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

State (that is, country) of nationality:

State (that is, country) of residence:

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

State (that is, country) of nationality:

State (that is, country) of residence:

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

State (that is, country) of nationality:

State (that is, country) of residence:

☐

Further applicants are indicated on another continuation sheet.

Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The following person is ☒ agent ☐ common representative
 and ☒ has been appointed earlier and represents the applicant(s) also for international preliminary examination.
☐ is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.
☐ is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

O'Brien, John A and Weldon, Michael J.
 c/o John A O'Brien & Associates
 Third Floor
 Duncairn House
 14 Carysfort Avenue
 Blackrock, County Dublin, Ireland

Telephone No.:

+ 353 1 2883877

Facsimile No.:

+ 353 1 2883878

Teleprinter No.:

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION**Statement concerning amendments:***

1. The applicant wishes the international preliminary examination to start on the basis of:

☒ the international application as originally filed

the description ☐ as originally filed
☐ as amended under Article 34

the claims ☐ as originally filed
☐ as amended under Article 19 (together with any accompanying statement)
☐ as amended under Article 34

the drawings ☐ as originally filed
☐ as amended under Article 34

2. ☐ The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.

3. ☐ The applicant wishes the start of the international preliminary examination to be postponed until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination:

☒ which is the language in which the international application was filed.

☐ which is the language of a translation furnished for the purposes of international search.

☐ which is the language of publication of the international application.

☐ which is the language of the translation (to be) furnished for the purposes of international preliminary examination.

Box No. V ELECTION OF STATES

The applicant hereby elects all eligible States *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes not to elect:

Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:

- | | | |
|--|---|--------|
| 1. translation of international application | : | sheets |
| 2. amendments under Article 34 | : | sheets |
| 3. copy (or, where required, translation) of amendments under Article 19 | : | sheets |
| 4. copy (or, where required, translation) of statement under Article 19 | : | sheets |
| 5. letter | : | sheets |
| 6. other (specify) | : | sheets |

For International Preliminary Examining Authority use only

- | received | not received |
|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |

The demand is also accompanied by the item(s) marked below:

- | | |
|--|---|
| 1. <input checked="" type="checkbox"/> fee calculation sheet | 4. <input type="checkbox"/> statement explaining lack of signature |
| 2. <input type="checkbox"/> separate signed power of attorney | 5. <input type="checkbox"/> nucleotide and or amino acid sequence listing in computer readable form |
| 3. <input type="checkbox"/> copy of general power of attorney; reference number, if any: | 6. <input type="checkbox"/> other (specify): |

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).

John A O'Brien

For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:

2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):

3. ☐ The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply.

☐ The applicant has been informed accordingly.

4. ☐ The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.

5. ☐ Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

For International Bureau use only

Demand received from IPEA on:

PATENT COOPERATION TREATY

PCT

NOTIFICATION CONCERNING
SUBMISSION OR TRANSMITTAL
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

To:

O'BRIEN, John, A.
John A O'Brien & Associates
Duncairn House, 3rd floor
14 Carysfort Avenue
Blackrock
County Dubin
IRLANDE

Date of mailing (day/month/year) 16 February 1999 (16.02.99)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference TELL07/C/WO	
International application No. PCT/IE98/00106	
International publication date (day/month/year) Not yet published	
Applicant TELLABS RESEARCH LIMITED et al	International filing date (day/month/year) 15 December 1998 (15.12.98) Priority date (day/month/year) 15 December 1997 (15.12.97)

1. The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
2. This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
3. An asterisk(*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
4. The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
15 Dece 1997 (15.12.97)	970888	IE	11 Febr 1999 (11.02.99)
31 Augu 1998 (31.08.98)	S980712	IE	02 Febr 1999 (02.02.99)

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 740.14.35	Authorized officer V. Addor <i>V. Addor</i> Telephone No. (41-22) 338.83.38
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PATENT COOPERATION TREATY

PCT

NOTIFICATION CONCERNING
SUBMISSION OR TRANSMITTAL
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

To:

O'BRIEN, John, A.
John A O'Brien & Associates
Duncairn House, 3rd floor
14 Carysfort Avenue
Blackrock
County Dubin
IRLANDE

Date of mailing (day/month/year) 03 February 1999 (03.02.99)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference TELL07/C/WO	
International application No. PCT/IE98/00106	
International publication date (day/month/year) Not yet published	
Applicant TELLABS RESEARCH LIMITED et al	International filing date (day/month/year) 15 December 1998 (15.12.98) Priority date (day/month/year) 15 December 1997 (15.12.97)

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2. This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
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4. The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
31 Augu 1998 (31.08.98)	S980712	IE	02 Febr 1999 (02.02.99)

09 FEB 1999

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 740.14.35	Authorized officer V. Addor <i>V. Addor</i> Telephone No. (41-22) 338.83.38
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PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum) TELL07/C/WO

Box No. I TITLE OF INVENTION

"An ATM Cell Processor"

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

TELLABS RESEARCH LIMITED
Shannon Industrial Estate
Shannon
County Clare
Ireland

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State (that is, country) of nationality:

IE

State (that is, country) of residence:

IE

This person is applicant for the purposes of:

☐

all designated States

☒

all designated States except the United States of America

☐

the United States of America only

☐

the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

DEWAR, Kevin
Stone Park
Ballyallia
Ennis
County Clare
Ireland

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

GB

State (that is, country) of residence:

IE

This person is applicant for the purposes of:

☐

all designated States

☐

all designated States except the United States of America

☒

the United States of America only

☐

the States indicated in the Supplemental Box

☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:

☒

agent

☐

common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

O'BRIEN, John A; WELDON, Michael J,
c/o John A O'Brien & Associates,
Third Floor, Duncairn House,
14 Carysfort Avenue,
Blackrock,
County Dublin,
Ireland

Telephone No.

+ 353 1 2883877

Facsimile No.

+ 353 1 2993878

Teleprinter No.

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

O'DOWD, Brendan
4 Ashmount
Raheen
Limerick
Ireland

This person is:

- ☐ applicant only
☒ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

IE

State (that is, country) of residence:

IE

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

BREBNER, Gavin
73 Chemin charriere Blache
69130 Emilly
France

This person is:

- ☐ applicant only
☒ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

GB

State (that is, country) of residence:

FR

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
☐ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
☐ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

Regional Patent

- ☒ AP ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ EA Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ EP European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ OA OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (If other kind of protection or treatment desired, specify on dotted line):

- | | |
|--|--|
| <input checked="" type="checkbox"/> AL Albania | <input checked="" type="checkbox"/> LS Lesotho |
| <input checked="" type="checkbox"/> AM Armenia | <input checked="" type="checkbox"/> LT Lithuania |
| <input checked="" type="checkbox"/> AT Austria | <input checked="" type="checkbox"/> LU Luxembourg |
| <input checked="" type="checkbox"/> AU Australia | <input checked="" type="checkbox"/> LV Latvia |
| <input checked="" type="checkbox"/> AZ Azerbaijan | <input checked="" type="checkbox"/> MD Republic of Moldova |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina | <input checked="" type="checkbox"/> MG Madagascar |
| <input checked="" type="checkbox"/> BB Barbados | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BG Bulgaria | <input checked="" type="checkbox"/> MN Mongolia |
| <input checked="" type="checkbox"/> BR Brazil | <input checked="" type="checkbox"/> MW Malawi |
| <input checked="" type="checkbox"/> BY Belarus | <input checked="" type="checkbox"/> MX Mexico |
| <input checked="" type="checkbox"/> CA Canada | <input checked="" type="checkbox"/> NO Norway |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein | <input checked="" type="checkbox"/> NZ New Zealand |
| <input checked="" type="checkbox"/> CN China | <input checked="" type="checkbox"/> PL Poland |
| <input checked="" type="checkbox"/> CU Cuba | <input checked="" type="checkbox"/> PT Portugal |
| <input checked="" type="checkbox"/> CZ Czech Republic | <input checked="" type="checkbox"/> RO Romania |
| <input checked="" type="checkbox"/> DE Germany... and utility model | <input checked="" type="checkbox"/> RU Russian Federation |
| <input checked="" type="checkbox"/> DK Denmark... and utility model | <input checked="" type="checkbox"/> SD Sudan |
| <input checked="" type="checkbox"/> EE Estonia | <input checked="" type="checkbox"/> SE Sweden |
| <input checked="" type="checkbox"/> ES Spain | <input checked="" type="checkbox"/> SG Singapore |
| <input checked="" type="checkbox"/> FI Finland | <input checked="" type="checkbox"/> SI Slovenia |
| <input checked="" type="checkbox"/> GB United Kingdom | <input checked="" type="checkbox"/> SK Slovakia |
| <input checked="" type="checkbox"/> GE Georgia | <input checked="" type="checkbox"/> SL Sierra Leone |
| <input checked="" type="checkbox"/> GH Ghana | <input checked="" type="checkbox"/> TJ Tajikistan |
| <input checked="" type="checkbox"/> GM Gambia | <input checked="" type="checkbox"/> TM Turkmenistan |
| <input checked="" type="checkbox"/> GW Guinea-Bissau | <input checked="" type="checkbox"/> TR Turkey |
| <input checked="" type="checkbox"/> HR Croatia | <input checked="" type="checkbox"/> TT Trinidad and Tobago |
| <input checked="" type="checkbox"/> HU Hungary | <input checked="" type="checkbox"/> UA Ukraine |
| <input checked="" type="checkbox"/> ID Indonesia | <input checked="" type="checkbox"/> UG Uganda |
| <input checked="" type="checkbox"/> IL Israel | <input checked="" type="checkbox"/> US United States of America |
| <input checked="" type="checkbox"/> IS Iceland | <input checked="" type="checkbox"/> UZ Uzbekistan |
| <input checked="" type="checkbox"/> JP Japan | <input checked="" type="checkbox"/> VN Viet Nam |
| <input checked="" type="checkbox"/> KE Kenya | <input checked="" type="checkbox"/> YU Yugoslavia |
| <input checked="" type="checkbox"/> KG Kyrgyzstan | <input checked="" type="checkbox"/> ZW Zimbabwe |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea | |
| <input checked="" type="checkbox"/> KR Republic of Korea | |
| <input checked="" type="checkbox"/> KZ Kazakhstan | |
| <input checked="" type="checkbox"/> LC Saint Lucia | |
| <input checked="" type="checkbox"/> LK Sri Lanka | |
| <input checked="" type="checkbox"/> LR Liberia | |

Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after issuance of this sheet:

- ☒ ..India
- ☒ ..Grenada

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)

Box No. VI PRIORITY CLAIM		<input type="checkbox"/> Further priority claims are indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application: regional Office	international application: receiving Office
item (1) 15/12/1997	97 0888	IE		
item (2) 31/08/1998	S98 0712	IE		
item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s): 1, 2

* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA)
(if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):

ISA /

Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):

Date (day/month/year)

Number

Country (or regional Office)

Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following number of sheets:

request : 3
description (excluding sequence listing part) : 9
claims : 2
abstract : 1
drawings : 3
sequence listing part of description : 0

Total number of sheets : 18

This international application is accompanied by the item(s) marked below:

1. ☒ fee calculation sheet
2. ☐ separate signed power of attorney
3. ☒ copy of general power of attorney; reference number, if any:
4. ☐ statement explaining lack of signature
5. ☐ priority document(s) identified in Box No. VI as item(s):
6. ☐ translation of international application into (language):
7. ☐ separate indications concerning deposited microorganism or other biological material
8. ☐ nucleotide and/or amino acid sequence listing in computer readable form
9. ☐ other (specify):

Figure of the drawings which should accompany the abstract: 1

Language of filing of the international application: English

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

John O'Brien

For receiving Office use only		For International Bureau use only	
1. Date of actual receipt of the purported international application:		2. Drawings:	
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		<input type="checkbox"/> received:	
4. Date of timely receipt of the required corrections under PCT Article 11(2):		<input type="checkbox"/> not received:	
5. International Searching Authority (if two or more are competent): ISA /		6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.	

Date of receipt of the record copy by the International Bureau: